Improving compliance with cervical cancer screening guidelines

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Current cervical cancer screening guidelines for the care of healthy women include HPV cotesting with all Papanicolaou (Pap) smears after the age of 30. To improve compliance with current guidelines, we instituted two processes: first, simplifying the ordering process to a single order for Pap smear plus HPV cotesting using an electronic medical record system (EMR); and second, providing education for clinic staff. Baseline and postintervention data were collected by retrospective chart review. Patients were selected during three intervals: prior to the transition to Epic EMR, after the transition to Epic, and after an educational intervention. Compliance with standard guidelines was evaluated in relation to the trial intervals, type of provider, patient age, and duration from the previous Pap smear. Provider type was analyzed by considering gynecologists versus nongynecologist providers, and physicians versus mid-level providers. Overall, the percentage of compliance with HPV test ordering did not differ ($P = 0.21$) between intervals. Univariate analyses performed to identify factors likely to be associated with the practice of ordering HPV cotesting only involved the type of provider. In conclusion, transition to Epic and a training session had minimal impact on compliance with ordering HPV cotesting at the time of a Pap smear except among family practice physicians, who did significantly improve their compliance rate. Gynecologists and mid-level providers were more compliant with ordering HPV cotesting throughout, but did not significantly improve after the interventions.

Over the past 50 years, the rate of cervical cancer in the United States has decreased by over 50% (1). This success is largely due to the widespread implementation of the Papanicolaou (Pap) smear, which has become a routine part of well-woman exams. Recently, testing for human papillomavirus (HPV), a major cause of cervical cancer, has become a standard part of screening (2–6). In 2012, the American Congress of Obstetrics and Gynecology (ACOG) and the American Society of Colposcopy and Cervical Pathology (ASCCP) released new guidelines for the screening of cervical cancer (7–12). The greatest change was for women aged 30 to 65 years, for whom it is now recommended that those at low risk should receive a Pap smear combined with HPV cotesting once every 5 years. This is largely because HPV detected in women older than 30 years correlates with increasing rates of high-grade lesions (13). A Pap smear alone every 3 years is acceptable only if HPV cotesting is unavailable (14). In this study, our objective was to improve compliance rates with cervical cancer screening guidelines in women aged 30 to 65. The slightly higher cost of screening with HPV cotesting is outweighed by the reduction in more expensive tests such as colposcopy and excisional procedures. By fully taking advantage of HPV cotesting, the burden on the medical system could be decreased by increasing the testing interval, and unwarranted morbidity minimized by reducing the number of unnecessary procedures.

METHODS

We conducted a quality improvement trial to assess compliance with cervical cancer screening guidelines for women aged 30 to 65 among Baylor Scott & White health care providers at the Temple, Texas, site. The study was conducted in three phases: 1) baseline assessment of compliance with current cervical cancer screening guidelines; 2) assessment of compliance after implementation of the Epic electronic medical record (EMR) ordering system; and 3) assessment of compliance after education of clinical staff and transition to Epic.

A retrospective analysis was performed to investigate the rate of HPV cotesting. The PowerPath database was used to collect the first 500 medical record numbers for Pap smear orders received by the cytology lab during each timeframe. The Sequoia EMR was then used to access patients' charts for data collection. Approximately 400 charts were reviewed in each phase of the study. Inclusion criteria included women aged 30 to 65 with Pap smears ordered within the timeframe by Baylor Scott & White providers. Patients were excluded from the study if they met any of the following criteria: age younger than 30 or older than 65 years old; history of cervical intraepithelial neoplasia 2, cervical intraepithelial neoplasia 3, or cervical cancer; infection with HIV; and severe immunocompromise. An initial chart review was performed in October 2013 to determine if HPV cotesting was ordered per the ASCCP and ACOG guidelines. For each patient, we reviewed 1) if HPV cotesting was ordered when indicated, 2) type of ordering physician or provider (family medicine physician versus gynecologist or physician versus

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mid-level provider), 3) time interval since the patient's last Pap smear, and 4) patient age.

In February 2014, the Epic (Verona, WI) EMR system was implemented among Baylor Scott & White Temple facilities. This system was superior to Sequoia EMR in that it allowed for electronic ordering of tests and provided an order set that included both Pap and HPV testing. The order set is a preconfigured group of the two orders that allows for a speedier ordering process. Within Epic, the order panel can be accessed by searching for "Pap" or "HPV" and choosing the order set option. In March 2014, chart reviews were again performed.

A PowerPoint presentation discussing the current guidelines was then distributed by e-mail to all physicians and mid-level providers in the family medicine and obstetrics/gynecology departments. Two months after the distribution of educational materials, a third chart review was performed to determine if any changes in compliance occurred.

Compliance was evaluated in relation to the trial intervals, type of provider, patient age, and the duration from the previous Pap smear. Compliance was expressed as percentages of Pap smears where HPV cotesting was ordered. Univariate analyses using chi-square and Student's *t* tests were performed for these four variables to identify those with $P \leq 0.1$ to be included in a logistic regression model. Results of the regression model were expressed as associations with HPV cotesting using odds ratios that differed from 1 with $P < 0.05$.

RESULTS

In total, records from 1161 subjects undergoing Pap smears were included in this study. These records were obtained from patients undergoing Pap smears during the three intervals relative to the transition to Epic and to a subsequent educational training event. *Figure 1* shows the comparison of age distributions between patients in each group. The ages were similar ($P = 0.83$). Univariate analyses were performed to identify those variables likely to be related to the practice of ordering HPV cotesting *(Table 1)*. Two variables related to type of provider were developed. These included the provider specialty (gynecologist versus nongynecologist) and the provider type (mid-level versus physician). The results of the logistic regression demonstrated that both variables were independently associated with ordering HPV cotesting *(Table 2)*.

There was a concern that some types of providers may have been more responsive to the effects of the Epic transition and the training event. *Table 3* provides an analysis of the subdivision of providers. Only family practice providers (physicians and mid-level providers) demonstrated an improvement ($P < 0.05$) during the transition from pre-Epic to post-education.

DISCUSSION

At the Temple site, transition to the Epic EMR and an educational session did not impact overall compliance with ordering HPV cotesting when looking at all providers in all specialties. However, it did significantly improve compliance specifically among family practice physicians. Gynecologists and mid-level providers of all specialties were associated with more frequent ordering of HPV cotesting. We were concerned that individual provider effects might confound our findings since the large number of unique providers in our data set did not allow for controlling for individual providers. Given the large number of patients in this study, we have some assurance that any detected effects were not due to specific providers who contributed disproportionately to the data set.

It is likely that gynecologists did not show improvement in their ordering practices as they were already more compliant than the other specialties. These findings may be attributable to the differences in education between gynecologist providers and family practice providers. For family medicine providers who do not have intense education and training in the topic of cervical screening, significant improvement was seen in compliance after a brief educational session was given. However, gynecologists receive regular updates on Pap smear guidelines from multiple resources such as ACOG and did not show a significant improvement in compliance following the reeducation. Mid-level providers may have had better compliance with guidelines because their practices tend to be more focused on preventive care and less on problem visits. It is possible that physicians become overwhelmed by time constraints and complicated medical problems and occasionally overlook basic preventive tests.

Based on our study results, future efforts to improve compliance with cervical cancer screening guidelines should

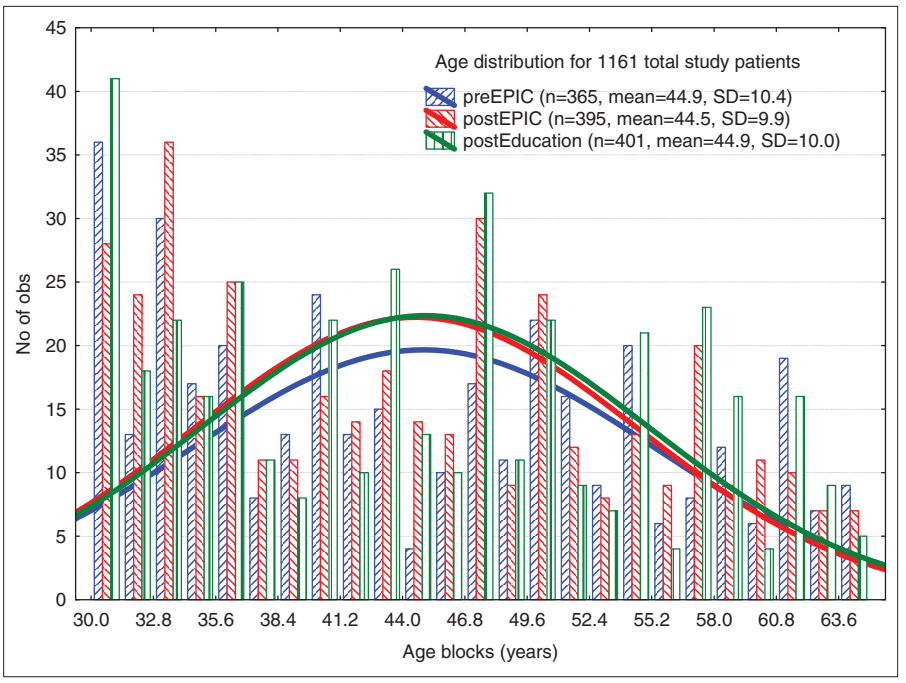

Figure 1. Age distributions of subject subgroups divided by the timing of their Papanicolaou test. Subgroups did not differ ($P = 0.83$ using analysis of variance) in age. Epic is the electronic medical record system.

Table 1. Variables that might be related to human papillomavirus testing coordering practices with Papanicolaou: univariate comparisons

Variable	HPV not ordered (n = 697)	HPV ordered (n = 464)	*P* value
Study interval			0.21[a]
Pre-Epic	228/365 (63%)	137/365 (38%)	
Post-Epic	242/395 (61%)	153/395 (39%)	
Post-education	227/401 (57%)	174/401 (43%)	
Provider			<0.0001[a]
Internal medicine			
Physician	32/39 (82%)	7/39 (18%)	
Nurse practitioner/physician assistant	67/117 (57%)	50/117 (43%)	
Family practice			
Physician	319/398 (80%)	79/398 (20%)	
Nurse practitioner/physician assistant	39/54 (72%)	15/53 (28%)	
Obstetrics and gynecology			
Physician	214/445 (48%)	231/445 (52%)	
Nurse practitioner/physician assistant	26/108 (24%)	82/108 (76%)	
Average patient age (years)	45 (n = 697)	44 (n = 464)	0.29[b]
Time since previous Pap (years)	3 (n = 425)	3.2 (n = 309)	0.43[b]

[a]Using chi-square test.
[b]Student's *t* test.
HPV indicates human papillomavirus; Epic is the electronic medical record system.

Table 2. Logistic regression model for ordering human papillomavirus testing*

Variable	Odds ratio	95% CI	*P* value
Provider is from gynecology specialty	4.6	3.5 to 5.9	<0.0001
Provider is mid-level (nurse practitioner/physician assistant)	2.7	2.0 to 3.6	<0.0001

*Complete data available for 1161 subjects. Using this model classification correctly predicts cases 66.3% of the time (area under the curve is 0.70 with 95% confidence interval [CI] of 0.68 to 0.73).

Table 3. Effects of time interval on human papillomavirus testing ordering practices for type of provider

	Proportion of Pap smear cases with HPV cotesting ordered			Chi-square
Type of provider	Pre-Epic	Post-Epic	Post-education	*P* value
Internal medicine physicians	2/19 (11%)	1/10 (10%)	4/10 (40%)	0.11
Family practice physicians	13/121 (11%)	26/121 (21%)	40/156 (26%)	0.007
Gynecologists	85/150 (57%)	78/162 (48%)	68/133 (51%)	0.31
General mid-level providers	13/35 (37%)	17/43 (40%)	20/39 (51%)	0.41
Family practice mid-level providers	4/14 (29%)	1/16 (6%)	10/24 (42%)	0.049
Ob/gyn nurse practitioners	20/26 (77%)	30/43 (70%)	32/39 (82%)	0.43
Total	137/365 (38%)	153/395 (39%)	174/401 (43%)	0.21

HPV indicates human papillomavirus; Epic is the electronic medical record system.

be focused more on clinical decision support through Epic and less on generic education. Currently, no clinical decision support for cervical cancer screening is built into the Epic system, although it does have the capability to provide notifications for due screening tests (requiring acknowledgment on the part of the provider) and suggest order panels based on entries in the patient's problem list. Additionally, personalized feedback needs to be given to providers. Physicians are slow to adopt new guidelines, and as more time passes compliance may improve for all specialties. The primary reason cited by providers for noncompliance was patient anxiety; patients were hesitant to extend screening to 3 to 5 years based on the historical belief that they should have annual screening, suggesting that further education is required for both patients and physicians.

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